

**REMARKS**

Applicants thank the Examiner for examining the application. Applicants have amended claims 1, 27, 53, 54, and 110 to further clarify the invention as claimed and to expedite prosecution. Applicants have also canceled claims 3, 4, 31, 59, 60, 85, 86, 112, and 113. With the amendment, claims 1-2, 5-18, 20-30, 32-58, 61-84, 87-111, and 114-136 are pending.

**Claim Rejections – 35 U.S.C. § 102(e)**

The Examiner rejected claims 27-38, 44-46, and 48-52 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,266,658 to Adya et al.

Applicants have amended independent claim 27 to recite the limitation formerly present in dependent claim 31, namely that the solution refiner further generates at least one new candidate index solution by eliminating at least one index on a small table under evaluation, wherein the at least one index does not enforce an integrity constraint. The Examiner cited to col. 2 lines 55-65 of Adya et al. as disclosing this limitation.

However, the cited text of Adya et al. fails to disclose a solution refiner that further generates at least one new candidate index solution by eliminating at least one index on a small table under evaluation, wherein the at least one index does not enforce an integrity constraint, as required by Applicants' amended independent claim 27. The relevant lines of col. 2 of Adya et al. are lines 55-59, which state: "A further approach takes semantic information such as uniqueness, reference constraints and rudimentary statistics ("small" vs. "big" tables) and produces a database design. Such designs may perform poorly because they ignore valuable workload information." Applicants believe that lines 60-65 of col. 2 of Adya et al. are irrelevant because they discuss a different approach from the one disclosed in lines 55-59, one that does take workload information into account; see Adya et al. col. 2 lines 62-63. Focusing only on col. 2 lines 55-59, Applicants see no disclosure of eliminating at least one index on a small table under evaluation, wherein the at least one index does not enforce an integrity constraint, as required by Applicants' amended independent claim 27, but rather an

approach to creating a database design based on semantic information such as whether a table is “small” or “big”. The Examiner has therefore failed to show that Adya et al. discloses a solution refiner that further generates at least one new candidate index solution by eliminating at least one index on a small table under evaluation, wherein the at least one index does not enforce an integrity constraint, as required by Applicants’ amended independent claim 27, and thus, for at least the reasons given above, Applicants’ amended independent claim 27 is allowable over Adya et al.

Applicants’ dependent claims 28-38, 44-46, and 48-52 all depend from Applicants’ allowable amended independent claim 27. Therefore, for at least the reasons given above, Applicants’ dependent claims 28-38, 44-46, and 48-52 are themselves allowable over Adya et al.

*Claim Rejections – 35 U.S.C. § 103(a)*

The Examiner next rejected claims 1-6, 8-12, 16, 18, 20, 22-24, 26, 53-54, 56, 58-60, 62-64, 66-70, 74, 76-77, 79-81, 83-86, 88-90, 92-96, 100, 102-103, 105-107, 109-113, 115-117, 119-123, 127, 129-130, 132-134, and 136 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 5,960,432 to Chaudhuri et al. (Chaudhuri et al. I) in view of U.S. Patent No. 6,223,171 to Chaudhuri et al. (Chaudhuri et al. II).

Applicants have amended independent claim 1 to include the limitations formerly present in Applicants’ dependent claims 3 and 4. Applicants’ amended independent claim 1 now requires, among other things, repeatedly deriving a candidate index set and analyzing collected statistics based on the proposed index set; and terminating the repeated execution when at least one candidate index solution is found that adheres to user-imposed constraints and no further indexes can be removed from said candidate index solution without degrading performance of the workload and without disabling an integrity constraint. The Examiner cited to col. 23 lines 48-67 of Chaudhuri et al. II as disclosing repeatedly deriving a candidate index set and analyzing collected statistics based on the proposed index set. The Examiner cited to col. 15 lines 35-64 and col. 23 line 25 to col. 24 line 6 as disclosing terminating the repeated execution when at least one candidate index solution is found that adheres to user-imposed constraints and no

further indexes can be removed from said candidate index solution without degrading performance of the workload and without disabling an integrity constraint.

As the Examiner knows, MPEP § 2143 requires, among other things, that to make a *prima facie* case of obviousness, the cited reference(s) teach or suggest every limitation in the claim.

However, the cited text of Chaudhuri et al. II fails to teach or suggest repeatedly deriving a candidate index set and analyzing collected statistics based on the proposed index set, as required by Applicants' amended independent claim 1. In col. 23 lines 48-67, Chaudhuri et al. II teaches a database administrator exploring two what-if index analysis scenarios and evaluating each relative to an existing database configuration; see col. 23 lines 48-50. In other words, the database administrator analyzes one hypothetical configuration and, not being pleased with the results, analyzes a second hypothetical configuration; see col. 23 lines 50-51 and 60-64. Satisfied with the results of the second hypothetical configuration, the database administrator decides to go with it; see col. 23 line 67 to col. 24 line 6. The database administrator does not repeatedly derive a candidate index set and analyze collected statistics based on the proposed index set, as required by Applicants' amended independent claim 1, but rather tries one configuration of a database and then another, and determines which of the two configurations returns a better result.

Further, the cited text of Chaudhuri et al. II fails to teach or suggest terminating the repeated execution when at least one candidate index solution is found that adheres to user-imposed constraints and no further indexes can be removed from said candidate index solution without degrading performance of the workload and without disabling an integrity constraint, as required by Applicants' amended independent claim 1. In col. 15 lines 35-64, Chaudhuri et al. II teaches evaluating a workload W with respect to a hypothetical configuration having a hypothetical set of indexes  $\{I_1, I_3\}$  and a table size of ten million rows; see col. 15 lines 26-34. This evaluation is performed by creating the hypothetical index  $I_3$ , see col. 15 lines 35-37, and then running a query optimizer for each query in the workload W to obtain a cost estimate and index usage for each query with respect to the hypothetical configuration, so that the estimated cost of the whole

workload W may then be determined by summing the cost estimation returned for each query; see col. 15 lines 48-58. In other words, a repeated process is terminated, but only when there are no more queries left for the query optimizer to process. The repeated process that is terminated is not a process that derives a candidate index set, as required by Applicants' amended independent claim 1, but rather one that evaluates queries given an index set. Further, the repeated process is not terminated when at least one candidate index solution is found that adheres to user-imposed constraints and no further indexes can be removed from said candidate index solution without degrading performance of the workload and without disabling an integrity constraint, as required by Applicants' amended independent claim 1.

In col. 23 line 25 to col. 24 line 6, Chaudhuri et al. II teaches a process used twice by a database administrator to determine which columns in which tables are good candidates for indexing, as described above. The database administrator terminates the process, but does so because he/she has found a configuration that improves the cost of running the workload; see col. 23 line 64 to col. 24 line 6. The database administrator has not terminated the repeated execution when he/she found at least one candidate index solution that adheres to user-imposed constraints and no further indexes can be removed from said candidate index solution without degrading performance of the workload and without disabling an integrity constraint, as required by Applicants' amended independent claim 1. Indeed, the cited text of Chaudhuri et al. II does not teach or suggest removing any indexes from a candidate index solution, as required by Applicants' amended independent claim 1.

Therefore, for at least the reasons given above, Chaudhuri et al. I and Chaudhuri et al. II, either alone or in combination, fail to teach or suggest all of the elements of Applicants' amended independent claim 1. Thus, Applicants' amended independent claim 1 is allowable over the combination of Chaudhuri et al. I and Chaudhuri et al. II.

Applicants have also amended independent claims 53, 54, and 110 similarly to Applicants' allowable amended independent claim 1. In other words, the limitations formerly present in Applicants' dependent claims 59 and 60 are now found within

Applicants' amended independent claim 53, the limitations formerly present in Applicants' dependent claims 85 and 86 are now found within Applicants' amended independent claim 54, and the limitations formerly present in Applicants' dependent claims 112 and 113 are now found within Applicants' amended independent claim 110. Thus, Applicants' amended independent claims 53, 54, and 110 all contain limitations similar to those of Applicants' allowable amended independent claim 1, discussed above. Therefore, for at least the reasons given above with regard to Applicants' allowable amended independent claim 1, Applicants' amended independent claims 53, 54, and 110 are themselves allowable over Chaudhuri et al. II, and thus are allowable over the combination of Chaudhuri et al. I with Chaudhuri et al. II.

Applicants' dependent claims 2-6, 8-12, 16, 18, 20, 22-24, 26, and 56 depend from Applicants' allowable amended independent claim 1. Applicants' dependent claims 58-60, 62-64, 66-70, 74, 76-77, 79-81, and 83 depend from Applicants' allowable amended independent claim 53. Applicants' dependent claims 84-86, 88-90, 92-96, 100, 102-103, 105-107, and 109 depend from Applicants' allowable amended independent claim 54. Applicants dependent claims 111-113, 115-117, 119-123, 127, 129-130, 132-134, and 136 depend from Applicants' allowable amended independent claim 110. Applicants' amended independent claims 1, 53, 54, and 110 are all allowable over the combination of Chaudhuri et al. I with Chaudhuri et al. II at least for the reasons given above. Therefore, all of these dependent claims, which depend from Applicants' allowable amended independent claims 1, 53, 54, and 110, respectively, are themselves allowable over the combination of Chaudhuri et al. I with Chaudhuri et al. II.

The Examiner next rejected claims 7, 65, 91, and 118 under 35 U.S.C. § 103(a) as being unpatentable over Chaudhuri et al. I in view of Chaudhuri et al. II and further in view of U.S. Patent No. 5,924,088 to Jakobsson et al.

The Examiner also rejected claims 13-15, 71-73, 97-99, and 124-126 under 35 U.S.C. § 103(a) as being unpatentable over Chaudhuri et al. I in view of Chaudhuri et al. II and further in view of U.S. Patent No. 6,003,022 to Eberhard et al.

The Examiner also rejected claims 17, 75, 101, and 128 under 35 U.S.C. § 103(a) as being unpatentable over Chaudhuri et al. I in view of Chaudhuri et al. II and further in view of U.S. Patent No. 5,404,510 to Smith et al.

The Examiner also rejected claims 21, 78, 104, and 131 under 35 U.S.C. § 103(a) as being unpatentable over Chaudhuri et al. I in view of Chaudhuri et al. II and further in view of U.S. Patent No. 6,021,405 to Celis et al.

The Examiner also rejected claims 25, 82, 108, and 135 under 35 U.S.C. § 103(a) as being unpatentable over Chaudhuri et al. I in view of Chaudhuri et al. II and further in view of Adya et al.

The Examiner next rejected claims 55, 61, 87, and 114 under 35 U.S.C. § 103(a) as being unpatentable over Chaudhuri et al. I in view of Chaudhuri et al. II and further in view of Gurry et al. ("Oracle Performance Tuning").

Applicants' dependent claims 7, 13-15, 17, 21, 25, and 55 depend from Applicants' allowable amended independent claim 1. Applicants' dependent claims 61, 71-73, 75, 78, and 82 depend from Applicants' allowable amended independent claim 53. Applicants' dependent claims 87, 91, 97-99, 101, 104, and 108 depend from Applicants' allowable amended independent claim 54. Applicants' dependent claims 114, 118, 124-126, 128, 131, and 135 depend from Applicants' allowable amended independent claim 110. Applicants' amended independent claims 1, 53, 54, and 110 are all allowable over the combination of Chaudhuri et al. I with Chaudhuri et al. II for at least for the reasons given above. Therefore, Applicants' dependent claims 7, 13-15, 17, 21, 25, 55, 61, 71-73, 75, 78, 82, 87, 91, 97-99, 101, 104, 108, 114, 118, 124-126, 128, 131, and 135 are themselves all allowable over the combination of Chaudhuri et al. I and Chaudhuri et al. II. Applicants' dependent claims 7, 13-15, 17, 21, 25, 55, 61, 71-73, 75, 78, 82, 87, 91, 97-99, 101, 104, 108, 114, 118, 124-126, 128, 131, and 135 are thus allowable over the various combinations listed above, all of which include Chaudhuri et al. I and Chaudhuri et al. II.

The Examiner also rejected claims 39-41 under 35 U.S.C. § 103(a) as being unpatentable over Adya et al. in view of Eberhard et al.

The Examiner also rejected claim 43 under 35 U.S.C. § 103(a) as being unpatentable over Adya et al. in view of Smith et al.

The Examiner also rejected claim 47 under 35 U.S.C. § 103(a) as being unpatentable over Adya et al. in view of Celis et al.

The Examiner also rejected claim 57 under 35 U.S.C. § 103(a) as being unpatentable over Adya et al. in view of Gurry et al.

The Examiner also rejected claim 42 under 35 U.S.C. § 103(a) as being unpatentable over Adya et al. in view of Finkelstein et al. ("Physical Database Design for Relational Database").

Applicants' dependent claims 39-41, 42, 43, 47, and 57 all depend from Applicants' allowable amended independent claim 27. For at least the reasons given above, Applicants' allowable amended independent claim 27 is allowable over Adya et al. Therefore, Applicants' dependent claims 39-41, 42, 43, 47, and 57 are themselves allowable over Adya et al., and are also allowable over any combination of references that includes Adya et al. Applicants' dependent claims 39-41, 42, 43, 47, and 57 are thus allowable over the various combinations listed above, all of which include Adya et al.

### **CONCLUSION**

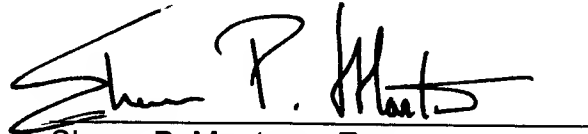
Applicants believe this Amendment and Response to be fully responsive to the present Final Office Action. Thus, based on the foregoing Remarks, Applicants respectfully submit that this application is in condition for allowance. Accordingly, Applicants request allowance of the application.

Applicants hereby petition for any extension of time required to maintain the pendency of this case. If there is any fee occasioned by this response that is not paid, please charge any deficiency to Deposit Account No. 50-3735.

Should the enclosed papers or fees be considered incomplete, Applicants respectfully request that the Patent Office contact the undersigned collect at the telephone number provided below.

Applicants invite the Examiner to contact the Applicants' undersigned Attorney if any issues are deemed to remain prior to allowance.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Shaun P. Montana", is written over a horizontal line.

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